

current to the lightly doped area).

When changing polarity of the applied voltage (applied), the source and (the) drain change places, and (the voltages to the gates) the potentials of the thick channel electrodes should be changed accordingly so as the transistor is to remain closed. In this case the transistor can maintain voltages up to several kilovolt depending on parameters of the lightly doped area, in the first place from the thickness and quantity donors between the gates as well as from a edge termination structure. To preserve an avalanche breakdown near edge of the substrate, to decrease on-voltage, to increase speed of response and current density might use a rib of rigidity of determined dimensions (fig. 11). The channels of the transistor have to dispose in the recess bottom. In this case the avalanche breakdown might have occurrence on the gate boundary near edge of the recess bottom or near edge of the thick channel depending on parameters.

Another voltage on the gates is about 0.8 V relatively of the (source) source and (the) drain which are nearby. It provides the opening of the channels and hole emission into the channels and the lightly doped area. The emission of holes to the lightly doped area is followed by electrons from the transistor source which makes the hole concentration and electron concentration practically the same in zero approximation and may reach the magnitude of $10 \cdot 10^{17} - 10 \cdot 10^{18} \text{ cm}^{-3}$; resistance of the transistor drops sharply due to conductivity modulation and the voltage between the drain and (the) source of the transistor as a rule does not exceed 0.5 V at current density $\approx 1000 \text{ A cm}^{-2}$. (The level of 0.4 V can be substituted by) There is a smoothly lowering voltage on the gate which is near the source of the transistor during the switching of the transistor from on-condition to off-condition, owing to extraction. To decrease the loss of switching off the voltage on the gate which is near the drain of the transistor should be decreased smoothly during the first part of time of switching off (approximately 1 μs).

"paragraph 0011". To increase operating current of the (have completely controllable) transistor (without latch), the offered BSITs (offered) should have the channel with a low resistance. To this end, thickness of the channel should be small and the impurity concentration near the gate should be high enough so that the electronic current flowing near the gate could not cause a large voltage drop which, in turn, could lead to emission of holes. To meet these requirements, it is desirable to grow an epitaxial layer with donor impurity concentration being about $10 \cdot 10^{17} \text{ cm}^{-3}$ on the surface of the lightly doped substrate having the donor impurity concentration about $10 \cdot 10^{14} \text{ cm}^{-3}$, and to have an equipment with higher resolution than is generally used for manufacturing other BSITs. A distance from a boundary of the epitaxial layer to the gate should be about 0.1 μm . On the surface of a monocrystalline silicon a layer of a polysilicon may be disposed that would help to form the elements of the transistor -- the gate, the source, the channel and the electrodes. The other variant -- implantation of both donor and acceptor in the gate and double drive-in diffusion to provide thin layer donor impurity near the gate.

"between paragraph 0011 and 0012". A solitary pulse current density (without switching off by the transistor) can be several times bigger, tending to 10000 A cm^{-2} . Auger recombination restricts the carrier density. In this case the hole concentration is approximately the same in the whole lightly doped area. The influence of diffusion currents is negligible. The offered transistors, as the transistor [3], can control power greater than any other types of transistors all over the world.

"between paragraph 0022 and 0023". Fig. 11 represents the substrate structure with the ribs of rigidity.

Fig. 12 represents offered transistor with a part of the high voltage control circuit (one


from several variants; for illustration only).

"between paragraph 0025 and 0026". Fig.11 comprises the operation part of the substrate 131, ribs of rigidity 132, recess 133.

The ribs of rigidity increase a mechanical durability of the substrate and permits to decrease the thickness of the operation part and to improve main performances of the transistor.

Fig.12 comprises the offered transistor 110, hole emission key 111, hole discharge (extraction) key 112, electron discharge key 113, amplifier with nonlinear feedback (polarity fixture)114,115,113; diodes 116-120, hole emission key 121, hole discharge (extraction) key 122, electron discharge key 123, amplifier with nonlinear feedback (polarity fixture) 124,125,123; diodes 126-130; (transistors 111,112,113,121,122,123 -- lowvoltage bipolar static induction transistors).

If the drain voltage exceeds a threshold voltage it extracts electrons from the thick channel through the group of diodes 116-120 or 126-130 and preserves further increasing of the voltage on the transistor.

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